California, Water and Sustainability in the 21st Century

Presented at Workshop on Water Sustainability in Silicon Valley: A Vision for the Future

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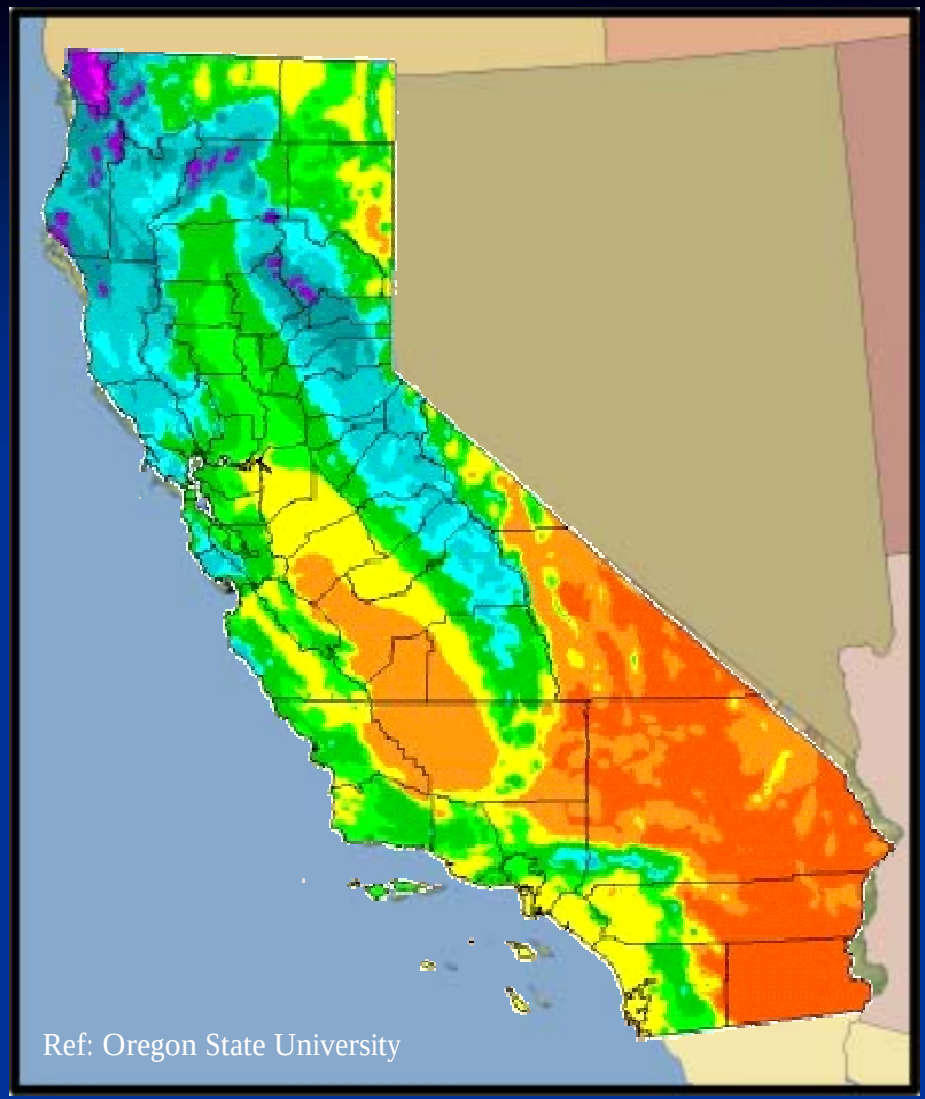
by
Timothy K. Parker, RG, CEG, CHG

Ref: Santa Clara Valley Water District

- Most populous state
  - Over 36 million
- Top agricultural state
  - Over half nation's fruit, nuts and vegetables
- Fifth largest economy
  - $1.4 trillion
  - All aspects of economy dependent upon water
- Largest number of native plants and animal species

California
A Wonderful Place to Live



- Mediterranean climate
  - Ideal for people, crops, unique plants and animals
- Wide variation in precipitation spatially, seasonally and over time
- Most of precipitation and runoff in north state
- Two thirds of the population in south state

California
A Diverse Place to Live

- California's major water projects
- New large, inter-basin projects on this scale not foreseeable due to technical, economic or environmental challenges
- Some incremental increases may be possible, but not enough to keep up with the population growth projections

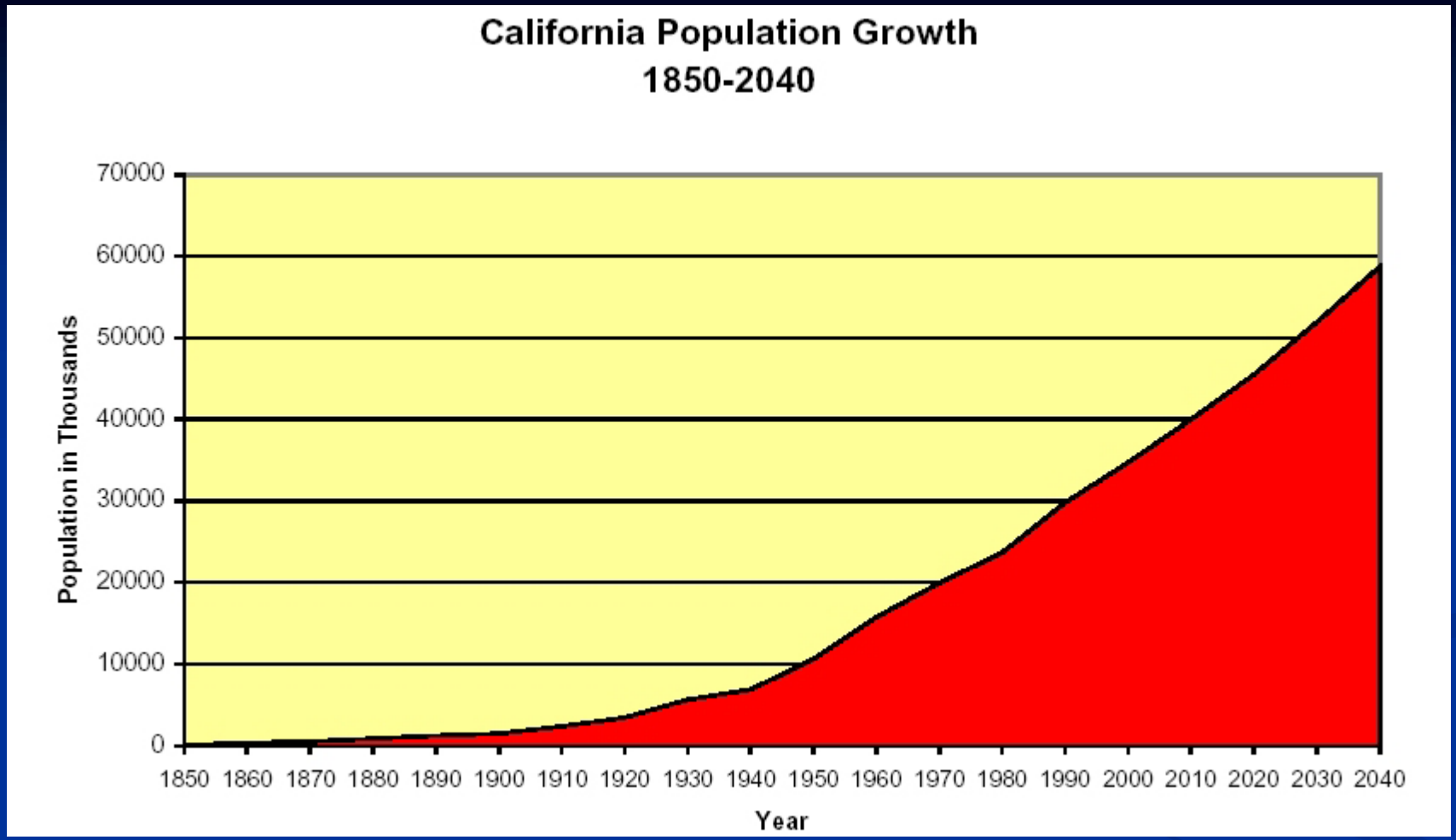
California
A Complex Place to Live

The Future Water Picture

- Less water from the Colorado River
- State and Federal Projects
  - don't count on much in the way of increases
- Bay Delta (CalFed)
  - Budget limitations
  - Increase in environmental needs
  - Lack of consensus on surface storage projects and budget constraints to complete detailed studies
  - Groundwater storage moving ahead, goal 500TAF

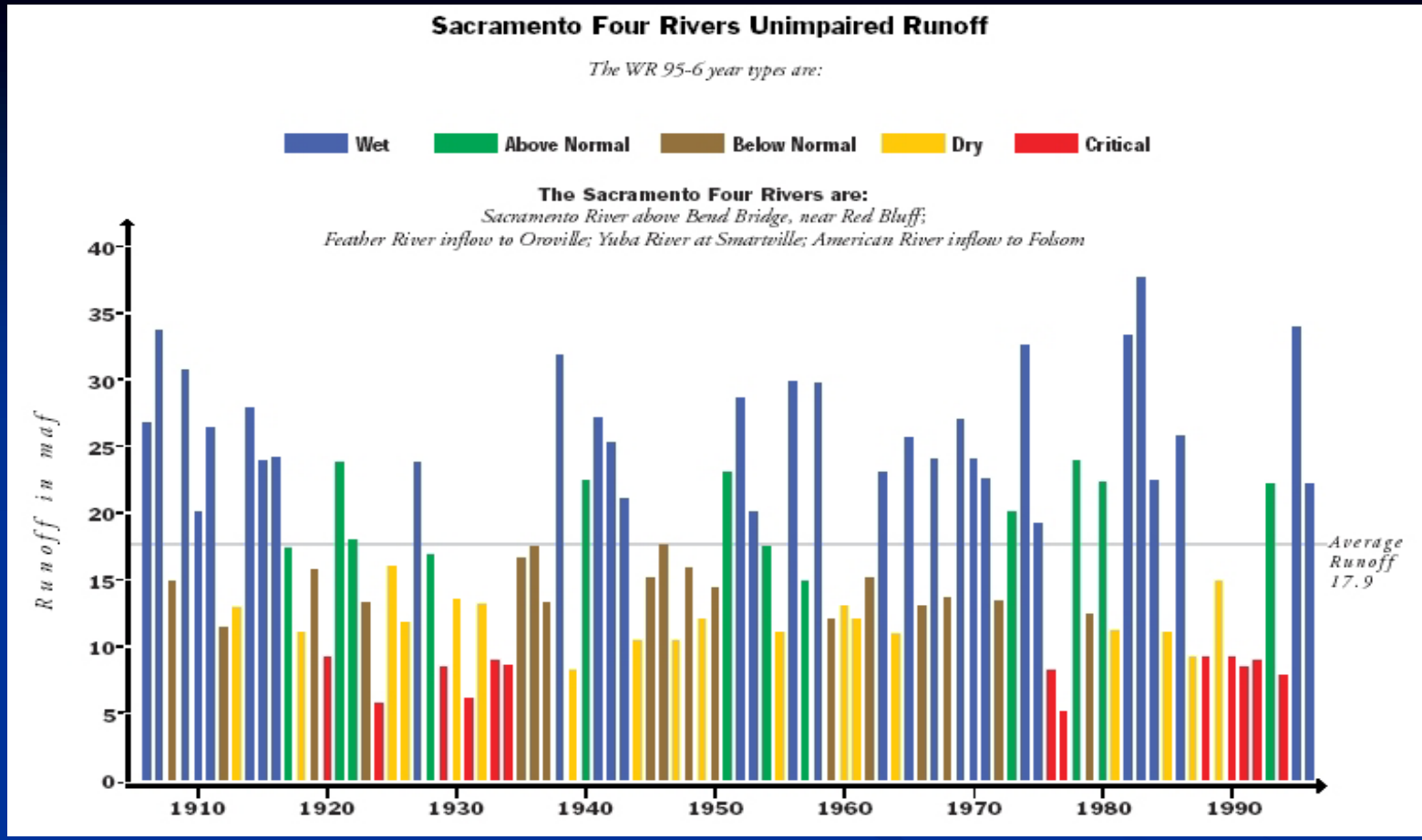
The Future Water Picture

- Continued population growth and demands
- Climate fluctuations, droughts, and change
- Constraints on inter-regional deliveries
- Water quality concerns including increasing domestic wastewater and urban runoff, emerging contaminants
- Continued groundwater overdraft
- Future emphasis on Regionalism
  - ***Optimization of water supply reliability by development of integrated resource management actions at the local and regional level***

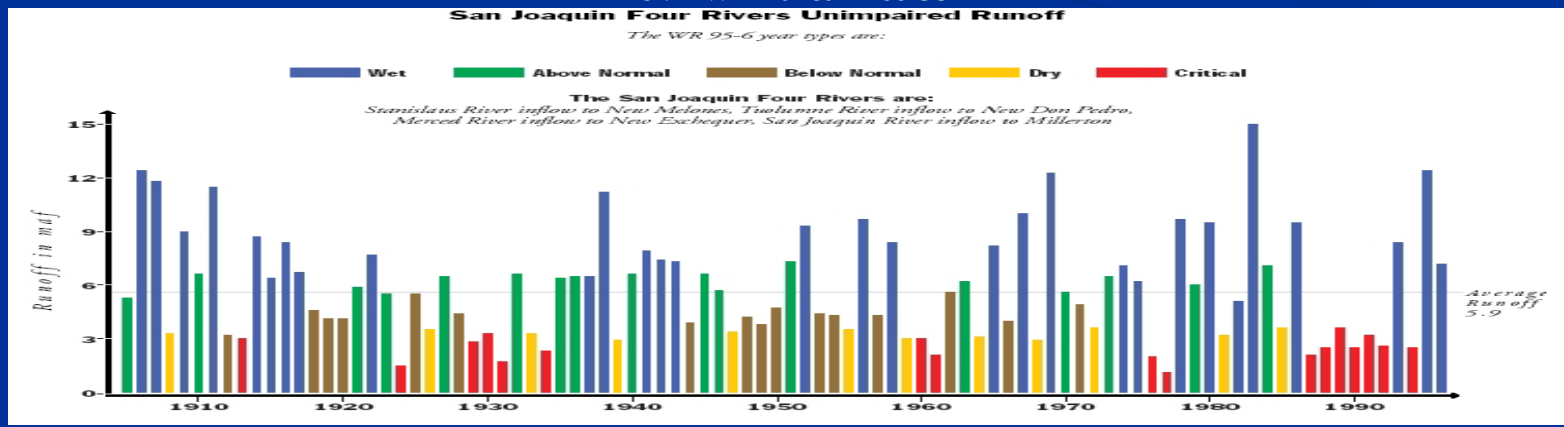


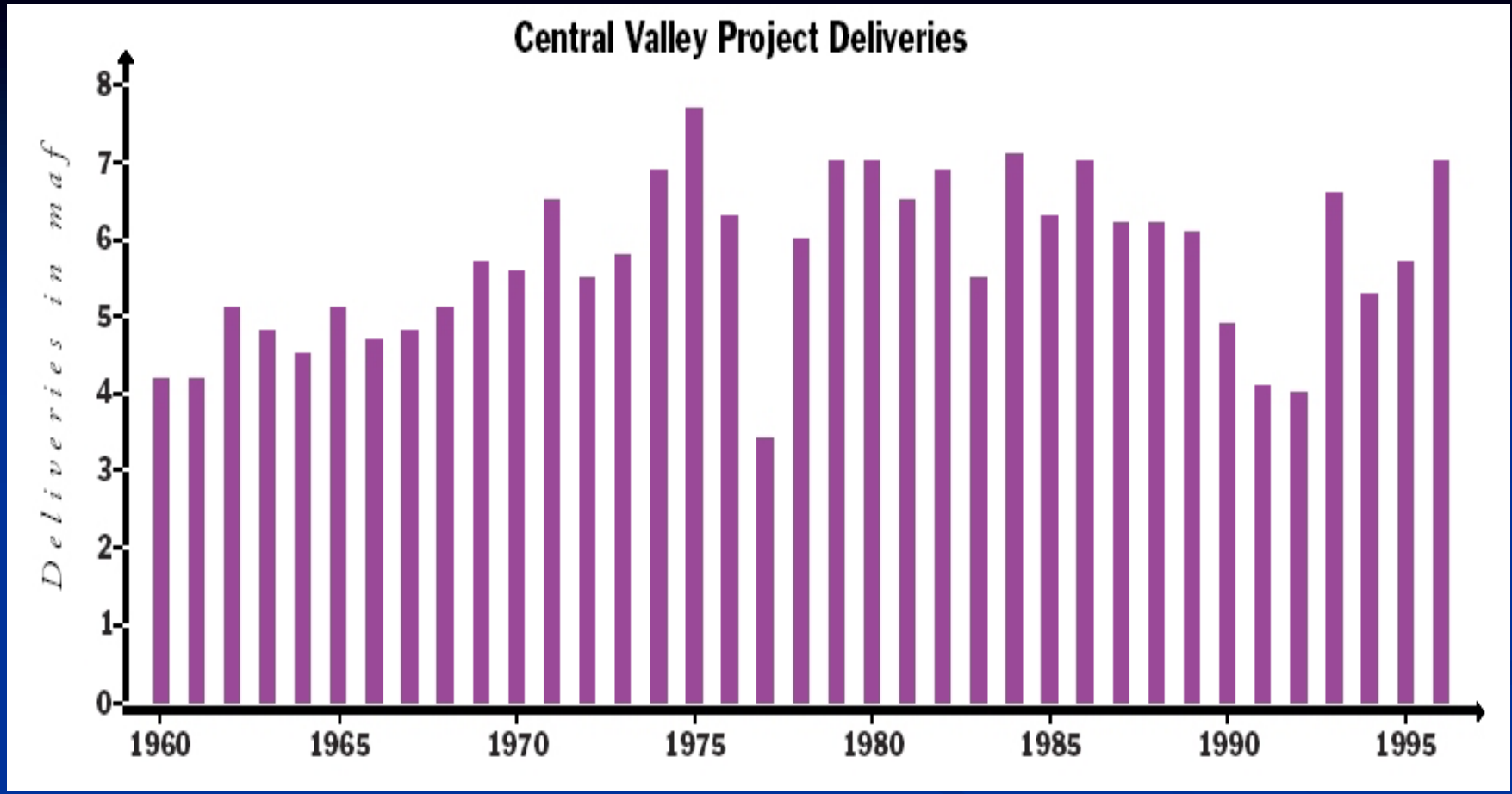
Ref: CA Department of Finance

California
A Popular Place to Live



Ref: DWR Bulletin 160-98





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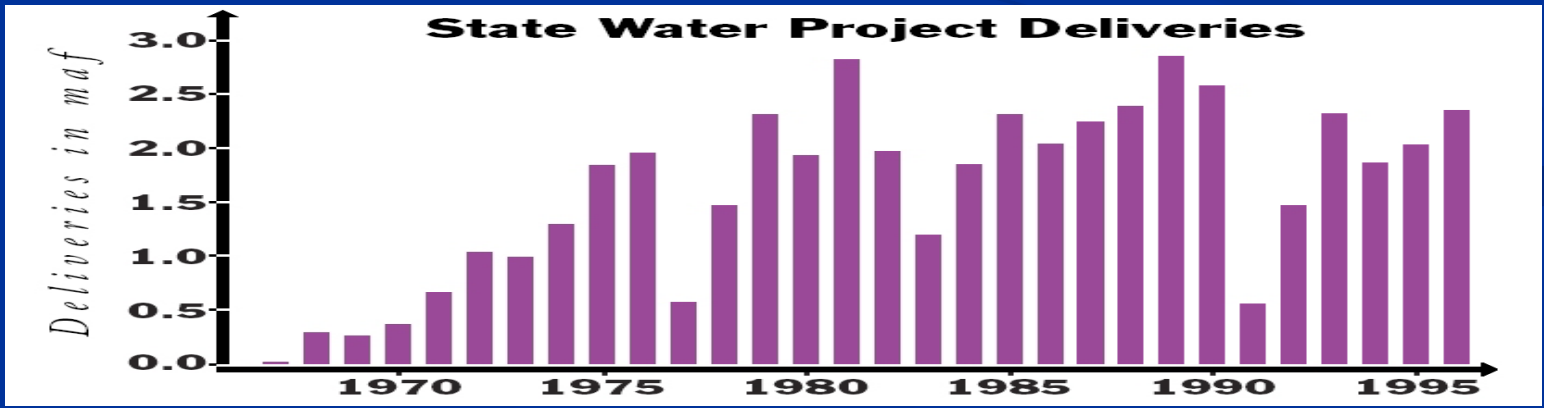
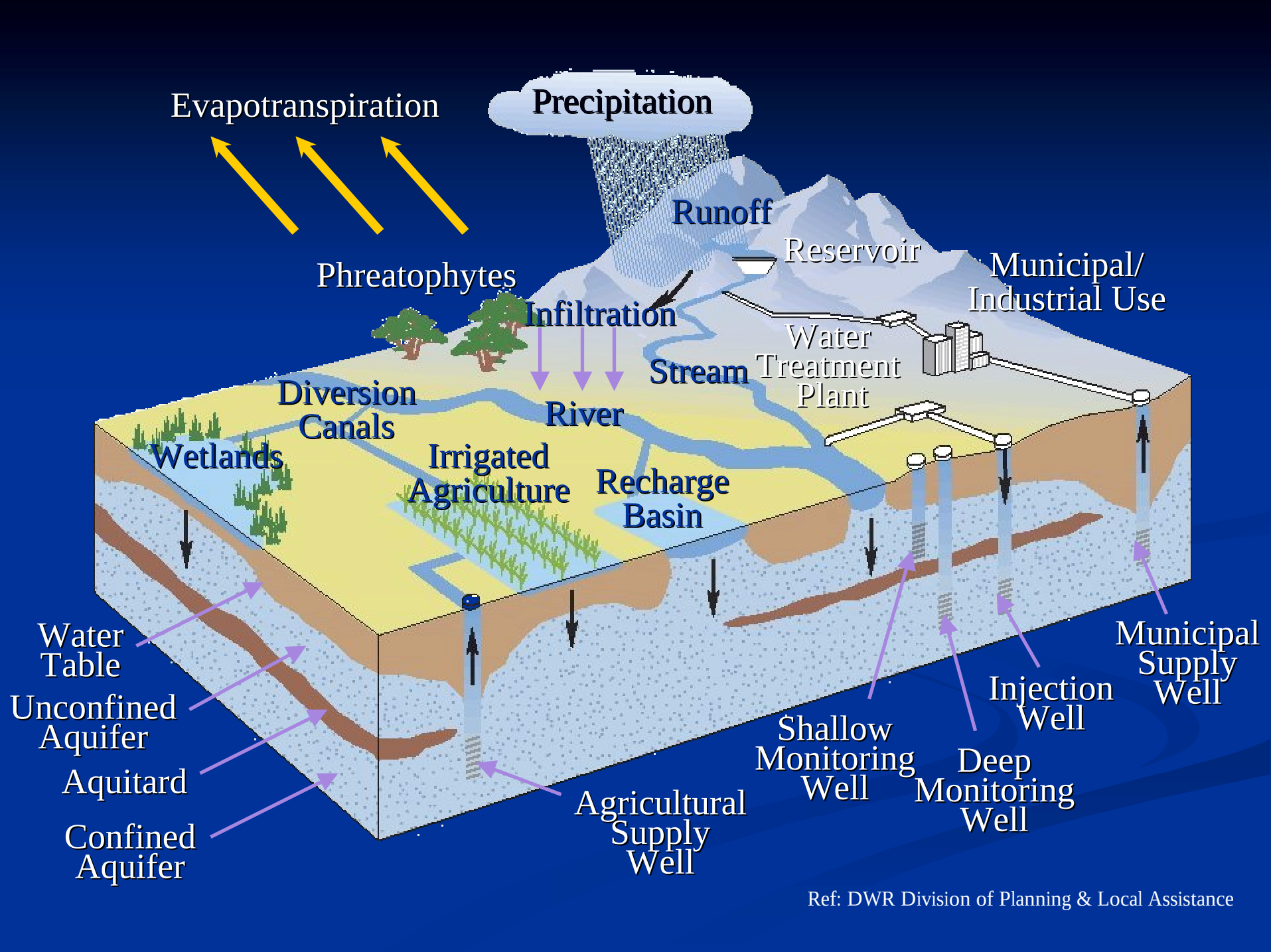


Future Water Strategies

- Agricultural water use efficiency
- Aquifer remediation
- Conjunctive management
- Conservation technologies
- Desalination
- Improved drinking water treatment and distribution
- Economic incentives policy
- Ecosystem restoration
- Match water quality to end use
- Pollution prevention
- Precipitation enhancement
- Recharge area protection
- Recycled municipal water reuse
- Urban land use management
- Urban runoff management
- Water transfers
- Watershed management



Ref: DWR Division of Planning & Local Assistance

California Groundwater Sustainability is Critically Important

- California uses roughly 18 percent of the groundwater extracted in the nation (15.2 TAF - USGS Circular 1268)
  - Public supply 3.1 TAF
  - Domestic 0.29 TAF
  - Irrigation 13.1 TAF
- California supplies over one-half the fruits, vegetables and nuts to consumers in the nation
- Over half of California's drinking water supply comes from groundwater
- Vital to public health, the environment, and the economy
- Conjunctive use of surface water and groundwater provides opportunity to increase dry year reliability and supply

Groundwater Resource Sustainability

"Development and use of groundwater in a manner that can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences." *(USGS Circular 1186)*

- Overdraft / depletion
- Increased extraction cost
- Well replacement cost
- Land subsidence
- Water quality degradation, salinity intrusion
- Decreases in streamflow
- Environmental damage

Concept of Sustainability fosters a long-term perspective to resources management.

Groundwater Sustainability Challenges

- Increased demand due to population growth
- Anthropogenic water quality degradation, past and present
- Invisible and hidden from view, must rely on groundwater wells for information
- Wells are expensive to build, collect and evaluate data
- Data nearly always inadequate, greater uncertainty in decision process
- Groundwater properties not well understood by most people
- Legal rights differ for surface water and groundwater, although interconnected and part of hydrologic cycle

Groundwater Sustainability Strategies

- Prevent contamination, protect aquifers and recharge areas always a necessity
- Use sources of water other than local groundwater
- Change rates or spatial patterns of pumpage
- Increase recharge to groundwater system
- Decrease discharge from groundwater system
- Change volume of groundwater in storage at different time scales (months/years v. decades)
- Combination of strategies

Conclusions

- Our water supply is finite and variable over time
- We cannot expect significant increases in water supply from state and federal programs
- Population is projected to continue to increase in the future and water demands will also increase
- There are many strategies available to help meet the future water demands – decision process
- Future emphasis on regionalism and integrated resource management at the local level to sustain water resource quality and quantity

Conclusions

- Quantity and quality are inseparable and either one may be a limiting factor
- Agricultural, urban, environmental and other stakeholders must agree on a definition of "sustainable" that is mutually equitable and environmentally sensitive
- Potential unacceptable consequences should be identified and monitored, for example, groundwater levels and groundwater quality, subsidence, and surface water quality

And more conclusions

- The 3 P rule to protect groundwater is PREVENT, PREVENT, PREVENT groundwater contamination
- Conjunctive use, conservation, recycling, desalination will play bigger roles in the future
- Recharge areas and aquifers should be more actively protected by planning agencies
- Land use agencies and water management agencies should collaborate in future planning

Laws of ecology

- Everything is connected to everything else
- Everything must go somewhere
- Nature knows best
- There is no such thing as a free lunch

Barry Commoner

Suggested Reading and References

- Sustainability of Groundwater Resources, USGS Circular 1186
  http://water.usgs.gov/pubs/circ/circ1186/
- UGS Groundwater Publications
  http://water.usgs.gov/ogw/pubs.html
- Sustainable Water Resources Roundtable
  http://water.usgs.gov/wicp/acwi/swrr/
- Pacific Institute – Water and Sustainability
  http://www.pacinst.org/water.html
- Kansas Geological Survey – Safe Yield and Sustainable Development of Water Resources in Kansas
  http://www.kgs.ukans.edu/Publications/pic9/pic9_1.html
- Water Resources Research Center, University of Arizona - Seeking Sustainability
  http://www.ag.arizona.edu/AZWATER/publications/sustainability/
- National Council for Water and the Environment – Water Sustainability
  http://www.ncseonline.org/Updates/page.cfm?fID=3452
- International Geophysical Union – Commission of r Water Sustainability
  http://water-sustainability.ph.unito.it/
- UNESCO – Sustainable Development
  http://www.unesco.org/education/esd/english/sustainable/sustain.shtml
- Water Policy International
  http://www.thewaterpage.com/sustainability.htm
- GEMI Water Sustainability Tool
  http://www.gemi.org/water/index.htm
- DWR Water Use and Planning
  http://www.water.ca.gov/nav.cfm?topic=Water_Use_and_Planning